

Appl. S.N. 10/642,371  
Amdt. dated November 14, 2006  
Reply to Office Action of August 15, 2006  
Docket No. 100110197-1

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### REMARKS

The Office Action of August 15, 2006 has been received and carefully reviewed. It is submitted that, by this Amendment, all bases of rejection are traversed and overcome. Upon entry of this Amendment, claims 1-13 and 15-18 remain in the application. Claims 14 and 19-33 have been cancelled herein without prejudice. New claims 34-48 have been added. Reconsideration of claims 1-13 and 15-18, and examination of new claims 34-48 is respectfully requested.

#### *I. Claim Rejections – 35 USC §112*

Claims 1-18 stand rejected under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicants regard as the invention. The Examiner states that claim 1 includes the recitation "each recess having a bottom and side walls between the top surface of the membrane and the bottom of the recess", and that this recitation is indefinite because "between" is exclusive of endpoints, and the bottom is claimed to be between itself and the top surface of the membrane.

In response thereto, Applicants have amended claim 1 by removing the word "between" and replacing it with the phrase "the side walls extend from the top surface...to the bottom...." Applicants submit that this phrase provides a more definitive description (i.e., defines the endpoints) of the side walls of the recess. The amendment to claim 1 also clarifies that it is the side walls (and not the recess bottom) that are formed between the bottom of the recess and the top surface of the membrane. As such, Applicants respectfully submit that the rejection of claims 1-18 under 35 USC §112, second paragraph, has been traversed and overcome.

#### *II. Claim Rejections – 35 USC §102(b)*

Claims 1-5, 7-14 and 16-18 stand rejected under 35 USC §102(b) as being anticipated by Sasahara et al. (U.S. Publication No. 2002/0012825). With respect to claim 1, the Examiner states that Sasahara teaches a method of making nanoscale catalyst patterns comprising: (i) providing a malleable membrane having a top surface, (ii) forming one or more nanoscale recesses in the membrane, each recess having a

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bottom and side walls between the top surface of the membrane and the bottom of the recess, and (iii) depositing a layer of catalytic material on the top surface of the membrane and the bottom of the recesses. The Examiner states that Sasahara does not explicitly teach a mold having nanoscale protrusions and pressing the protrusions into the membrane. However, Sasahara teaches embossing to produce impressed features having nanoscale dimensions, and it would have been inherent that a mold having nanoscale protrusions was used because the embossed surface would substantially replicate the size of the embossments used.

The Applicants' method is directed to forming "nanoscale" recesses in a malleable membrane, as provided in claim 1. The Examiner points out that the term "nanoscale," as defined in the Applicants' specification, includes a range that overlaps with the range disclosed in Sasahara. Thus, to further distinguish the Applicants' method from that disclosed in Sasahara, claim 1 has been amended to recite, "each recess further including a lateral dimension ranging from about 1 nm to about 100 nm". Support for this recitation may be found throughout the specification as filed, at least at paragraph [0017]. This range is clearly outside of the range disclosed in Sasahara (see paragraph [0039] which teaches widths ranging from "5  $\mu$ m to 500  $\mu$ m" and depths ranging from "1  $\mu$ m to 5 min"). Applicants' range excludes the relatively large dimensions taught by Sasahara.

Sasahara states that "[a]ny nanoscale surface area enhancement within the catalyst-loaded interfaces 38 and 40 supplement the area enhancement in the mesoscale range." As such, Sasahara teaches forming a three-dimensional feature, such as a channel (see, for example, Fig. 5A) of mesoscale dimension, and that the three-dimensional feature may be enhanced in the nanoscale range. The nanoscale enhancements (which increase the reaction surface area) referred to in Sasahara are clearly not the original three-dimensional mesoscale feature (which are used for reactant flow). Fig. 8 of Sasahara depicts the nanoscale features defined on the mesoscale features. It is submitted that the formation of nanoscale patterns on a mesoscale feature, as taught by Sasahara, does not teach or suggest the formation of

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nanoscale features in a malleable material, without the formation of a mesoscale feature.

Applicants submit that if the nanoscale were suitable for Sasahara's features, such dimensions would have been included as an alternative to the mesoscale. Instead, the nanoscale features of Sasahara are disclosed for the purpose of enhancing the surface area **of the mesoscale features**. Since the nanoscale features of Sasahara are included specifically to enhance the reactive surface area of the mesoscale features, one skilled in the art would not be led to remove the formation of the mesoscale features from the method.

Since Sasahara does **not** teach or suggest the formation of nanoscale features without the mesoscale features, one can likely conclude that nanoscale sizes are **not** suitable for the stated purpose of the Sasahara mesoscale features (i.e., reactant flow). As such, it is submitted that, based on the teachings of Sasahara, one skilled in the art would not be led to form nanoscale features as anything other than surface enhancing features (such as the recesses recited in Applicants' claim 1) for mesoscale features.

In sharp contrast, Applicants are forming nanoscale recesses in an ion exchange membrane, without first forming mesoscale features.

For all the reasons stated above, it is submitted that claim 1 is not anticipated, taught, or rendered obvious in view of Sasahara, either alone or in combination, and patentably defines over the art of record. Claims 2-5, 7-14 and 16-18 depend from independent claim 1. It is submitted that, through this dependency, Applicants' invention as defined in these claims also is not anticipated, taught or rendered obvious in view of Sasahara, and patentably defines over the cited art.

### ***III. Claim Rejections – 35 USC §103(a)***

Claims 1-5, 7-14 and 16-18 stand rejected under 35 USC §103(a) as being obvious in view of Sasahara. In addition to the arguments set forth above, the Examiner further states that it would have been obviously desirable to vary the size of the protrusions in view of Sasahara's teaching to vary the imprint size.

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Applicants respectfully disagree with the Examiner. As previously stated, the size of each of Sasahara's features is suitable for achieving a stated purpose (e.g., mesoscale features for reactant flow and nanoscale features for surface enhancement). Sasahara was aware of the various sizes (meso and nanoscales), but did not specifically disclose altering the size of the specific features. As such, it is submitted that one skilled in the art would not be led to alter the mesoscale or the nanoscale features, as both sizes are taught as being suitable for obtaining a particular purpose.

For all the reasons stated above, it is submitted that amended independent claim 1 is not taught, suggested or rendered obvious in view of Sasahara, either alone or in combination, and is in a condition for allowance. Accordingly, it is submitted that dependent claims 2-5, 7-14 and 16-18 are also patentable through their dependency and, thus, in condition for allowance.

Claims 6 and 9 stand rejected under 35 USC §103(a) as being unpatentable over Sasahara in view of Chou (U.S. Patent No. 5,772,905). It is submitted that Sasahara does not teach or suggest Applicants' independent claim 1, from which claims 6 and 9 ultimately depend, and that Chou does not supply the deficiencies of Sasahara. Applicants submit that if one skilled in the art were to combine Sasahara with Chou, one would render a method that includes forming mesoscale features, and then forming nanoscale features in the surfaces of the mesoscale features using a nanoimprinting method as suggested by Chou. This is in sharp contrast to Applicants' method which forms nanoscale recesses in an ion exchange membrane (not in mesoscale features formed in a membrane). As such, it is submitted that claims 6 and 9 are not taught, suggested or obvious in view of Sasahara and Chou, either alone or in combination, and patentably define over the art of record.

#### **IV. NEW CLAIMS**

New claims 34-48 have been added in order to set forth additional specific embodiments of Applicants' invention. Support for these new claims may be found throughout the specification as filed and in the claims as filed.

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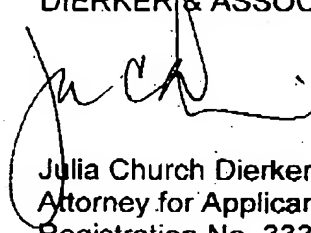
## V. SUMMARY

In summary, claims 1-13 and 15-18 remain in the application. New claims 34-48 have been added. It is submitted that, through this amendment, Applicants' invention as set forth in these claims is now in a condition suitable for allowance.

Further and favorable consideration is requested. If the Examiner believes it would expedite prosecution of the above-identified application, he is cordially invited to contact Applicants' Attorney at the below-listed telephone number.

Respectfully submitted,

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